

FUSE – Pune Activities Update



February, 2020

Introduction

The FUSE project is addressing Food-Water-Energy challenges and solutions, with a major focus on the Pune, India region. A series of workshops took place in February 2019, where stakeholders and policy experts shared visions, challenges, coping strategies, and

potential policy solutions. This document presents a short overview of data collection activities, fieldwork and a workshop undertaken by FUSE members in January 2020 in the Pune region.

FUSE in a nutshell

FUSE (Food-water-energy for Urban Sustainable Environments) is a transdisciplinary research project involving the Food-Water-Energy nexus in Pune (India). The project will develop a long-term systems model that can be used to identify viable paths to sustainability. It brings together natural and social scientists from Stanford University in California, USA, IIASA (International Institute for Applied Systems Analysis) in Laxenburg, Austria, UFZ (Helmholtz Centre for Environmental Research) in Leipzig, Germany, and ÖFSE (Austrian Foundation for Development Research) in Vienna, Austria. The project is a not-for-profit research effort and is part of the Sustainable Urbanisation Global Initiative of JPI Urban Europe and the Belmont Forum. Each of the national teams is supported individually by its own national science funding agency.

More information: <https://fuse.stanford.edu/>

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FUSE – the second year

The FUSE project is now approaching the end of its second year. We are delighted to have made important, enduring connections with stakeholders, experts, and modelers with whom we engaged in 2018 and 2019. Our team of natural and social scientists has been actively engaged in understanding the intricacies of the food-water-energy system in the Pune region and the surrounding Bhima basin in Maharashtra. There have been two distinct thrusts of our efforts: a focus on the water and food sectors, and developing an in-depth understanding of water, food and energy access and provision in Pune, with particular attention to slums. Among other things, this recently obtained information enables us to understand resource access and quantify water demand relationships for different categories of urban consumers.

Integrated Model Development: With the encouragement and assistance of the World Bank and the Water Resources Department in Maharashtra as well as help from other organizations, we have made inroads into obtaining data needed to build a model that enables evaluation of sustainable water-food-energy policies over the next several decades. This model will include a hydrologic simulation component that will be used to explore the status of freshwater resources in the region. It will also include an agriculture component used to quantify crop production and water use. In the future, we expect that there will be significant changes in land use and climate. For land use, we are developing a sequence of maps that represent projections reflecting demographic changes and that are consistent with historical patterns of land-use evolution. For climate change, we are building high spatial resolution projections of temperature and precipitation based on a suite of climate models that cover the likely range of climate outcomes and uncertainty about the future.



Food-water-energy Access and Provision: We have initiated a large data-collection effort aimed at understanding how residents in the city, particularly in the slum areas, obtain vital resources. Here we have collaborated with different partner institutions in Pune to conduct surveys and interviews. These included collecting questionnaire data and conducting in-depth interviews on the frequency of water supply and households capacity to store water. In addition, we attempted to better understand the water tanker market by talking with tanker businesses.

Field visit and Workshop: During a visit to Pune several members of our team collected further data, supervised a large-scale household survey, and conducted numerous interviews with consumers. Our team also held a workshop on January 28, 2020 organised by ÖFSE in cooperation with the Centre for Environment Education (CEE). There were 40 workshop participants and presentations by the FUSE team and Advanced Center for Water Resources Development and Management (ACWADAM). In addition to informing the participants about our progress, we received valuable feedback and suggestions for improvement and ideas on how to better transfer our results to the user community.

2020 Visit, Activities and Pune Workshop

Meeting Stakeholders to Fill Data Gaps

The visit to Pune in January 2020 offered a rewarding opportunity to continue to learn more about water management and agriculture in the Bhima basin. The interactions and challenges of water distribution among domestic, industrial, and agricultural sectors in the context of increasing demand and competition were again clear. FUSE members Dr Anjuli Jain Figueroa (Stanford University) and Dr Mikhail Smilovic (IIASA) were able to share the progress of the integrated FUSE model including the hydrological model (CWatM) with different government and water management offices. They received generally positive feedback, as well as questions and suggestions to move forward. With a better understanding of the different institutions involved in water management, they were more able to identify the appropriate offices with whom

to communicate and from whom certain data could be obtained. The team found that the offices kindly offered their time and thoughts and shared additional data needed for model development.

Household Interviews

FUSE member Yuanzao Zhu (UFZ), cooperated with Dr Vishal Gaikwad and his team at the Gokhale Institute of Politics and Economics to conduct a quantitative survey on household water-energy-food consumption in the Pune Metropolitan Region and the surrounding area. The objectives are to collect: 1) quantitative data from different types of households on their daily water, energy and food use as well as socio-economic and socio-demographic characteristics for household food-water-energy (FWE) nexus resource demand function estimation, and 2) qualitative information on household FWE nexus resource use, which is valuable to improve our understanding of consumer behaviour. Comprehensive questionnaires were developed for individual households and for the housing society or township manager. In all, 40 students from Pune-area colleges with economics background underwent a week of training aimed at carrying out in total 2000 anonymous door-to-door interviews with slum, formal urban, township and peri-urban households.

One aspect of the trip that affected us came from feedback we obtained in a certain area where people receive very limited piped water supply (e.g., a few hours every two days). Surprisingly, they were optimistic and said that this would still be enough for their daily use with the help of water storage. Some people monitored their own water use for activities such as dish washing, room cleaning and laundry by using buckets. This highlighted their desire to efficiently use their limited water resources. We also learned from local experts in Pune that, in their opinion, the consumption information from the water bills in Pimpri-Chinchwad lacks credibility.

Water Collection and Use in Slum Areas

In cooperation with the Pune-based NGO Maharashtra Social Housing and Action League (MASHAL), Heinrich Zozmann (UFZ) conducted in-depth, qualitative interviews about water collection, storage and use with residents of four slum areas. In a second step, these households and others filled out water diaries for one

week, documenting the timing and duration of water collection, along with the activities for which water is used in their households. Preliminary results from this field study indicate that there are strong differences in access to water in slums, depending on the timing of supply, the water pressure and how many people share a connection. Typically, female household members are in charge of water collection, and expend varying levels of time and effort to make water available to their families.



Community tap and water storage equipment in Ram Nagar, Pune

Tanker Water Markets: Structured Interviews and Volumetric Assessment

In addition, Heinrich explored available information on tanker water markets in Pune, with a particular focus on how these businesses operate. This information will be used in FUSE to understand the ways in which tanker water operations contribute to water supply and for which areas and water users this supply is most relevant. To this end, Heinrich cooperated with the Samidha Foundation to conduct 20 structured interviews with tanker water business owners and truck drivers. To derive a rough quantitative estimate of tanker water volumes in Pune, he implemented a monitoring study during which students from the Gokhale Institute counted water tankers at 11 strategic observation points in Pune for three consecutive days.

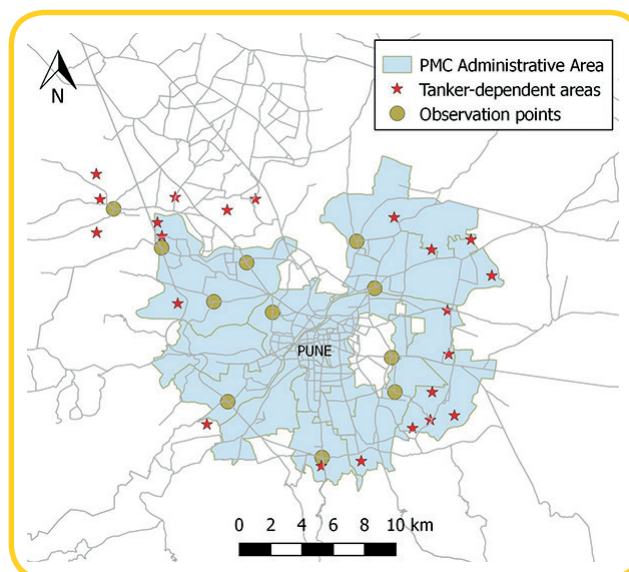


Figure 1: Overview of water tanker-dependent areas and observation points in our recent field study

Interviews: Rural-Urban Migration and Vulnerability in Slums

FUSE member Raphael Karutz (UFZ) conducted semi-structured interviews with slum residents who had migrated to the city from rural areas. The aim was to deepen our understanding of migration trajectories, focusing on the relevance of food-water-energy challenges as drivers.

One point that came up in several interviews was the inter-generational advance in formal education. Many of the people that Raphael interviewed were illiterate, because they grew up in villages without the chance to go to school. However, their children and in some cases their grandchildren, not only went to primary school but additionally went to secondary school and even went to college. One mother who had to work on the farm since early childhood and had no formal education at all told us proudly that her son had just obtained his MBA. This is an impressive example of how people use the new opportunities offered by moving to a city. This appears to apply to those moving to slums as well.

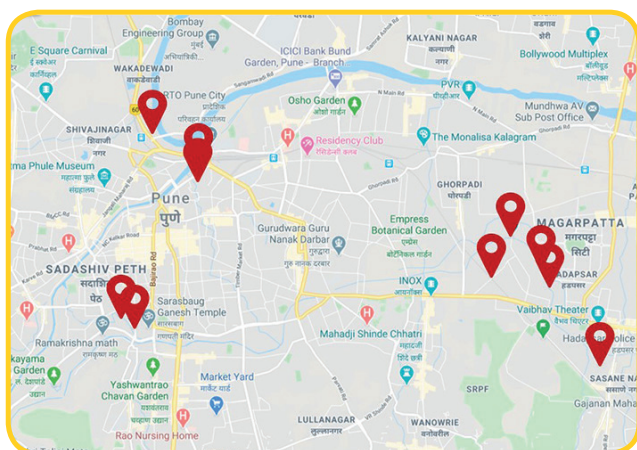


Figure 2: Location of interviews carried out during the field visit



Impressions of field work

FUSE-Workshop on January 28

The January 28, 2020 FUSE-Update Workshop was intended to present the beginnings of the integrated FUSE Nexus model, in which the information and input from the workshops in February 2019 are being incorporated. This workshop was organised by ÖFSE in cooperation with the Centre for Environment Education (CEE) and facilitated by its program director Sanskriti Menon. The combination of presentations by FUSE and ACWADAM met with great interest. About 40 participants from research, policy and civil society attended the workshop.

The FUSE team presented some first insights and findings, with a focus on the relation of the food-water-energy nexus to urban growth and on hydrologic assessment and modelling. The conceptualization of the model was the basis for discussion and attracted many questions, insights and suggestions for improvement.

Of interest were questions about the inclusion of legislation and reservoir operation practices, flood risk and green spaces, and leakages in pipes and canals. Although we cannot include erosion and sedimentation of dams, we have a valuable data set shared by the Basin Simulation Office and National Hydrologic Project to help us calibrate the flows from reservoirs. Green infrastructure and other policy options will be included via scenarios, which include a business as usual scenario that extrapolates current practices. Importantly, we heard the suggestion to avoid one-way (“silo”) thinking and to make sure we include reasonable leakage that accounts for the impact of groundwater-canal flow interactions. This of course raised a question about data since the estimates for leakage are not well-documented.

The FUSE team sought the help of participants to fill data gaps. Many of the hydrology data gaps were filled by the strong support of the Water Resources Department and associated offices including the Pune Irrigation Circle, National Hydrologic Project, and Basin Simulation Office. Our partnership with the Gokhale Institute helped improve our understanding of the agricultural data. We still aim to strengthen our understanding of urban water.

Dr. Himanshu Kulkarni's presentation on the results of ACWADAM's Pune aquifer mapping met with great interest and certainly made an impression, which was evident when we asked participants to rank some of the most pressing food-water-energy challenges and unregulated groundwater abstraction rose to the forefront. This is great feedback, since we plan and have capacity to include this in our integrated model.

Finally, we received advice regarding engagement of students and ensuring that the model can be used by programmers as well as non-programmers. The FUSE team is open to partners and students that may be interested in experience with a large international project. Furthermore, we will aim to clearly communicate our insights and results. We are exploring possible ways to enhance the capacity building element of the FUSE project to support the transfer of our integrated model to water managers and planners, among others.



Impressions of the workshop

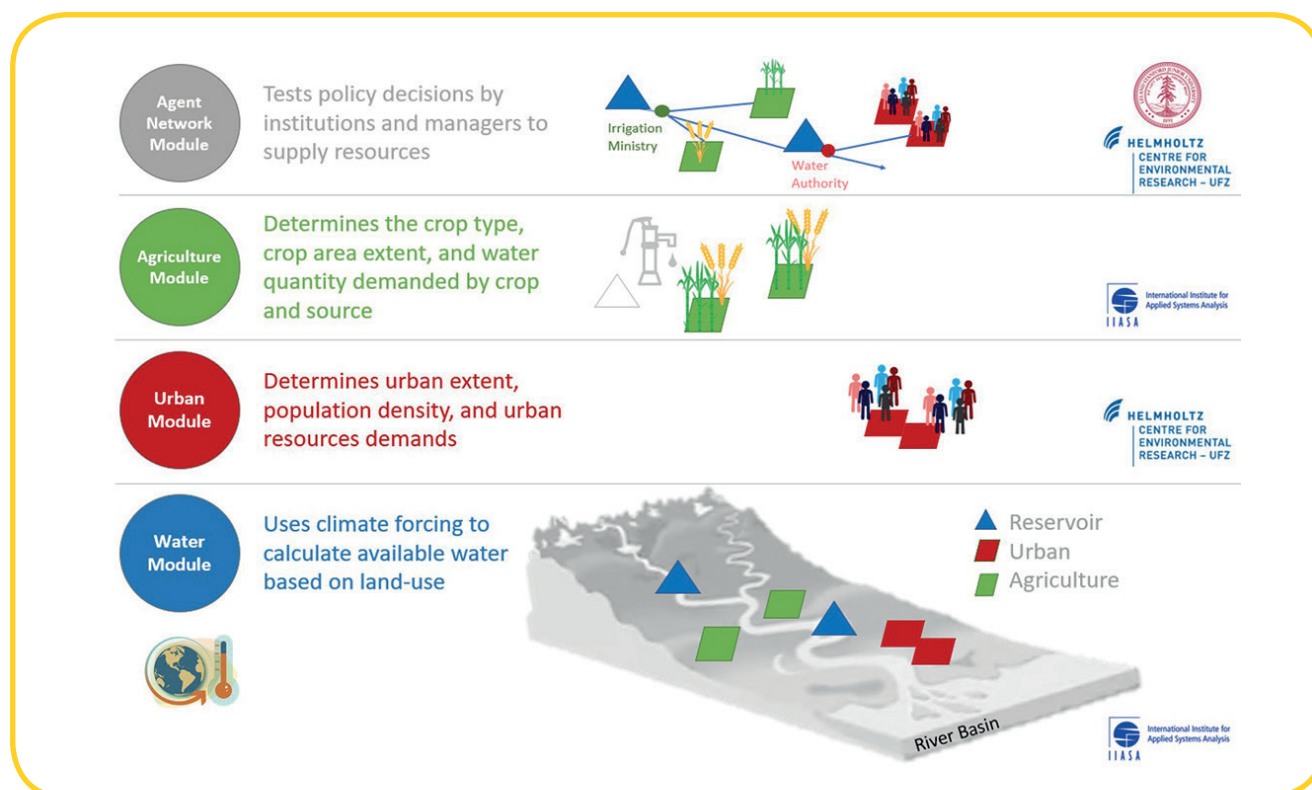


Figure 3: Conceptualization of the FUSE model

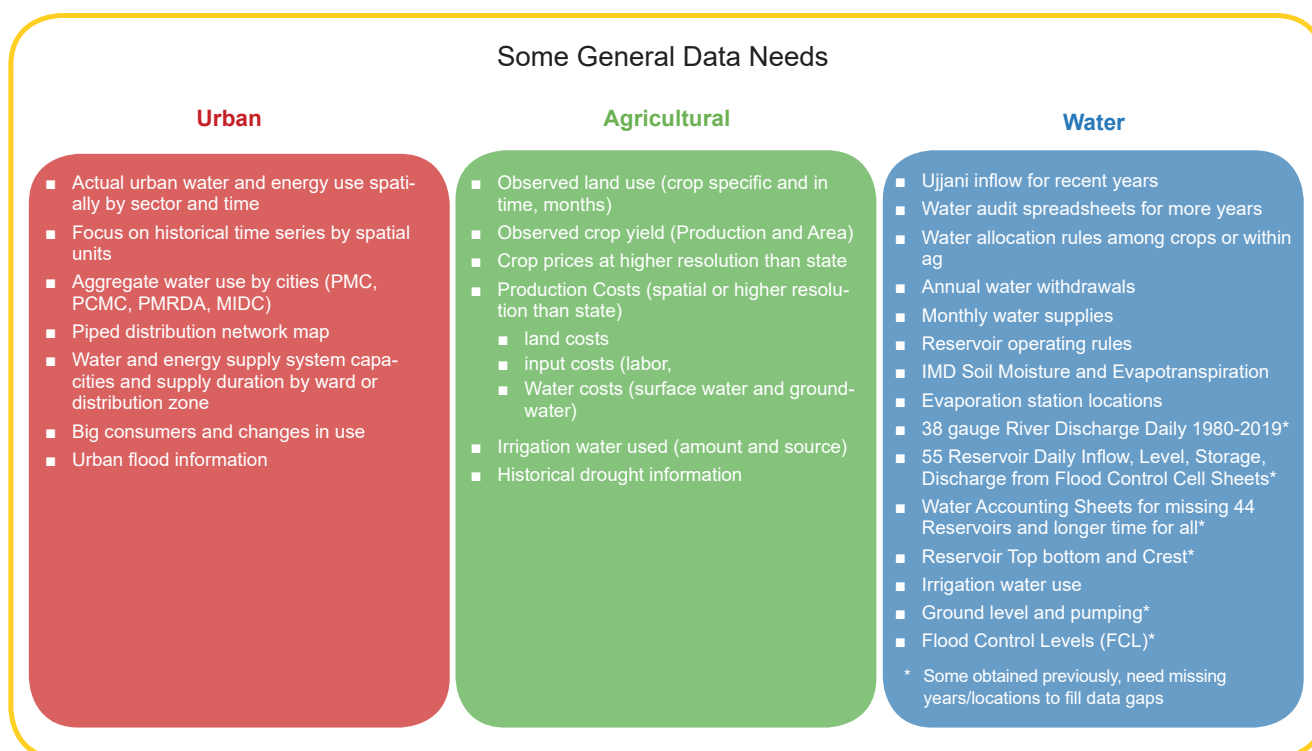


Figure 4: Data needs presented by the FUSE team during the workshop

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